Towards Privacy-preserving Content-based Image Retrieval in Cloud Computing

Abstract

- Content-based image retrieval (CBIR) applications have been rapidly developed along with the increase in the quantity, availability and importance of images in our daily life.
- However, the wide deployment of CBIR scheme has been limited by its the severe computation and storage requirement. In this paper, we propose a privacy-preserving content-based image retrieval scheme, which allows the data owner to outsource the image database and CBIR service to the cloud, without revealing the actual content of the database to the cloud server.
- Local features are utilized to represent the images, and earth mover's distance (EMD) is employed to evaluate the similarity of images. The EMD computation is essentially a linear programming (LP) problem.
- The proposed schemetransforms the EMD problem in such a way that the cloud server can solve it without learning the sensitive information. In addition, local sensitive hash (LSH) is utilized to improve the search efficiency. The security analysis and experiments show the security and efficiency of the proposed scheme.

Existing system

- wide deployment of CBIR scheme has been limited by its the severe computation and storage requirement. In this paper, we propose a privacy-preserving content-based image retrieval scheme, which allows the data owner to outsource the image database and CBIR service to the cloud, without revealing the actual content of the database to the cloud server.
- Local features are utilized to represent the images, and earth mover's distance (EMD) is employed to evaluate the similarity of images. The EMD computation is essentially a linear programming (LP) problem.

Disadvantages

- The need for efficient storage and retrieval of images is reinforced by the increase of largescale image databases among all kinds of areas.
- Meanwhile, as an emerging technology, Content-based Image Retrieval (CBIR) shows enough promise and maturity to be helpful in many real-world image retrieval/matching applications.
- For example, clinicians may use CBIR to retrieve the similar cases of the patients to facilitate the clinical decision-making process

Proposed system

- we propose a privacy-preserving content-based image retrieval scheme, which allows the data owner to outsource the image database and CBIR service to the cloud, without revealing the actual content of the database to the cloud server.
- Local features are utilized to represent the images, and earth mover's distance (EMD) is employed to evaluate the similarity of images. The EMD computation is essentially a linear programming (LP) problem.
- The proposed scheme transforms the EMD problem in such a way that the cloud server can solve it without learning the sensitive information. In addition, local sensitive hash (LSH) is utilized to improve the search efficiency. The security analysis and experiments show the security and efficiency of the proposed scheme

Advantages

- techniques from security, image processing and information retrieval domains to achieve secure and efficient searching over encrypted images. The proposed scheme supports local-feature based CBIR with the earth mover's distance (EMD) as similarity metric. In particular, a secure transformation is designed so that the cloud server can solve the EMD problem with the privacy preserved.

Hardware Requirements

- Processor :Intel Pentium IV 1GHz
- RAM :256MB (Min)
- Hard Drive :5GB free space
- Monitor :1024 * 768, High Color inch
- Mouse :Scroll Mouse(Logitech)
- Keyboard :104 keys

Software requirements

- OS : Windows XP/7/8
- Front End : Visual Studio 2010/ netbeans 7.1
- Back End : SQL Server 2005/ heidisql 3.2
- Browser : Any Web Browser

conclusion

- In this paper, we propose a privacy-preserving content based image retrieval scheme, which allows the data owner to outsource image database and the CBIR service to the cloud without revealing the actual content of the database. Local features are utilized to represent the images, and earth mover's distance (EMD) is employed to evaluate the similarity of images.
- We transform the EMD problem so that the cloud server can solve the problem without learning the sensitive information. In order to improve the search efficiency, we design a two-stage structure with LSH. In the first stage, dissimilar images are filtered out by pre-filter tables to shrink the search scope. In the second stage, the remaining images are compared under EMD metric one by one for refined search results.
- The security analysis and experiments show the security and efficiency of the proposed scheme. In the future, we will study how to outsource the feature extraction to the cloud server so as to further relieve the burden of data owner and data user.

References

[1] C. Pavlopoulou, A. C. Kak, and C. E. Brodley, "Content-based image retrieval for medical imagery," in *Medical Imaging 2003*. International Society for Optics and Photonics, 2003, pp. 85–96.

[2] A. K. Jain, J.-E. Lee, R. Jin, and N. Gregg, "Content-based image retrieval: An application to tattoo images," in *Image Processing (ICIP), 2009 16th IEEE International Conference on. IEEE, 2009*, pp. 2745–2748.

[3] J. M. Lewin, R. E. Hendrick, C. J. DOrsi, P. K. Isaacs, L. J. Moss, A. Karellas, G. A. Sisney, C. C. Kuni, and G. R. Cutter, "Comparison of full-field digital mammography with screen-film mammography for cancer detection: Results of 4,945 paired examinations 1," *Radiology, vol. 218, no. 3, pp. 873–880, 2001*.

[4] D. X. Song, D. Wagner, and A. Perrig, "Practical techniques for searches on encrypted data," in *Security and Privacy, 2000. S&P 2000. Proceedings. 2000 IEEE Symposium on. IEEE, 2000, pp. 44–55*.

[5] E.-J. Goh *et al., "Secure indexes." IACR Cryptology ePrint Archive*,

vol. 2003, p. 216, 2003